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**MICROANATOMY MIDTERM EXAMINATION
JANUARY 16, 1996**

SELECT THE SINGLE BEST ANSWER:

1. Which of the following is NOT a structure visible with the light microscope?
 - A. The nucleus
 - B. The rough endoplasmic reticulum (Nissl bodies)
 - C. The Golgi apparatus
 - ☒ D. The mitochondrial matrix
 - E. The mitotic spindle

2. The function(s) of membrane-associated proteins are associated with:
 - A. Lipid requiring enzymes.
 - B. Transmembrane pores.
 - C. Voltage-gated ion channels.
 - D. Polypeptide for glycosylation.
 - ☒ E. All of the above.

3. Which structure is NOT associated with the nucleolus?
 - ☒ A. Structural lamins
 - B. Heterochromatin
 - C. Pars granulosa
 - D. Pars fibrosa
 - E. Nucleolar organizing region

4. Proteins synthesized on the rough endoplasmic reticulum include all BUT:
 - A. Lysosomal proteins.
 - B. Golgi membrane integral proteins
 - ☒ C. Mitochondrial proteins
 - D. Plasma membrane glycoproteins
 - E. Peptide hormones

MNC P

5. A critical organelle for the processing and sorting of lysosomal, secretory, and membrane proteins is:

- A. The smooth endoplasmic reticulum.
- ☒ B. The Golgi apparatus.
- C. The lysosome.
- D. The peroxisome.
- E. The residual bodies.

6. Secondary lysosomes are involved in all of the following functions **EXCEPT**:

- ☐ A. Bacterial phagocytosis.
- ☐ B. Fluid pinocytosis.
- ☒ C. Free radical metabolism.
- ☐ D. Coated vesicle endocytosis.
- ☐ E. Mitochondrial containing autophagosomes.

7. Which structure is **NOT** a unique mitochondrial compartment?

- ☒ A. Outer membrane
- B. Intermembrane space
- C. Inner membrane
- ☒ D. Cristae

8. Tubulin is a component of:

- A. Microvilli.
- B. Stereocillia.
- C. Cleavage furrow.
- ☒ D. Flagella.
- E. None of the above.

9. Which structure is **NOT** considered to be a normal "cell inclusion"?

- A. Lipid droplets ✓
- ☒ B. Microtubular centrioles
- C. Glycogen rosettes
- D. Lipofuscin granules
- E. Melanin granules

10. The cardiac myocyte is mitotically arrested in:

- ☒ A. G-0.
- B. G-1.
- C. S phase.
- D. G-2.
- E. M phase.

11. The phase of mitosis where one is most likely to observe well-separated chromosomes, the cleavage furrow, but not the midbody, is:

- A. Prophase.
- B. Metaphase.
- C. Early anaphase.
- ☒ D. Early telophase.
- E. Late telophase.



12. Which phase of mitosis is characterized by condensed chromosomes and the dissolution of the nuclear envelope?

- ☒ A. Prophase
- B. Metaphase
- C. Early anaphase
- D. Late telophase
- E. Cytokinesis

13. The epithelial structure of the secretory region of sweat glands is:

- A. Simple squamous.
- B. Stratified squamous non-keratinizing.
- C. Stratified squamous keratinizing.
- ☒ D. Simple cuboidal.
- E. Transitional.

14. The epithelium of the vagina and the esophagus is classified as:

- A. Simple squamous.
- ☒ B. Stratified squamous non-keratinizing.
- C. Stratified squamous keratinizing.
- D. Simple cuboidal.
- E. Transitional.

TRUE OR FALSE:

A = TRUE; B = FALSE

- A 15. A The major analytical method for the separation of intracellular components is called differential centrifugation.
- B 16. B Proteins and lipids in a membrane have a high degree of lateral mobility, as well as a high degree of transmembrane "flip-flop" mobility.
- F 17. B The rough endoplasmic reticulum forms a membrane continuation with the Golgi apparatus.
- A 18. A The function of the nucleolus is the transcription of r-RNA.
- B 19. B The nucleosome form of nuclear chromatin packaging is composed of solenoids and histones packed into a ~~monomeric~~ ^{hexameric} structure.
- B 20. B A key signal in the targeting of lysosomal enzymes into the final lysosome is the phosphorylation of covalently bound fructose to ~~fructose~~ ^{mannose} 6-phosphate, for which there are receptors in the trans Golgi complex.
- B 21. A The mitochondrion is a four compartment structure involved in energy metabolism, carbohydrate and protein anabolism, and fatty acid biosynthesis.
? Build up? - no.
- A 22. A Cytokinesis is a parallel phase of mitotic cell division.
- B 23. B Epithelial tissue is embryologically derived from ectoderm, mesoderm, and endoderm, and is one of ~~several~~ ^{many} tissues derived from all three germinal layers.
- B 24. B The close association of the zonula occludens, the zonula adherens, and desmosomes near the apical surface of epithelial cells is called the basal lamina.
- B 25. B Microvilli are supported by a scaffolding of ~~tubulin~~ ^{actin} filaments radiating from the zonula adherens, forming what is called the terminal web.
- A 26. A Stereocilia are not really cilia, but are elongated microvilli, containing actin as their structural support, and serving to increase cell surface area for fluid absorption.
- B 27. B Colchicine and vinblastine are chemotherapeutic drugs because they prevent the formation of secretory vesicles from the Golgi apparatus in cancerous cells.
or polym. (prev.)
- B 28. B Endocrine glands are ductless glands which secrete only hormones into the blood.

TRUE OR FALSE: A = TRUE; B = FALSE

29. The binding of calcium to calmodulin, and the activation of light chain kinase are normal events in the contractile cycle of smooth muscle.

30. A unique structural feature of smooth muscle is a large, ovoid central nucleus.

SINGLE BEST ANSWER:

31. Select the correct statement(s).

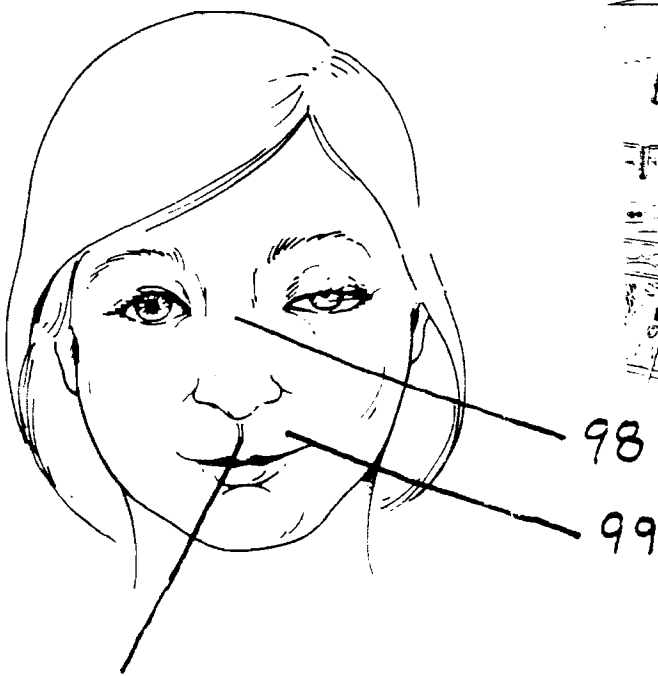
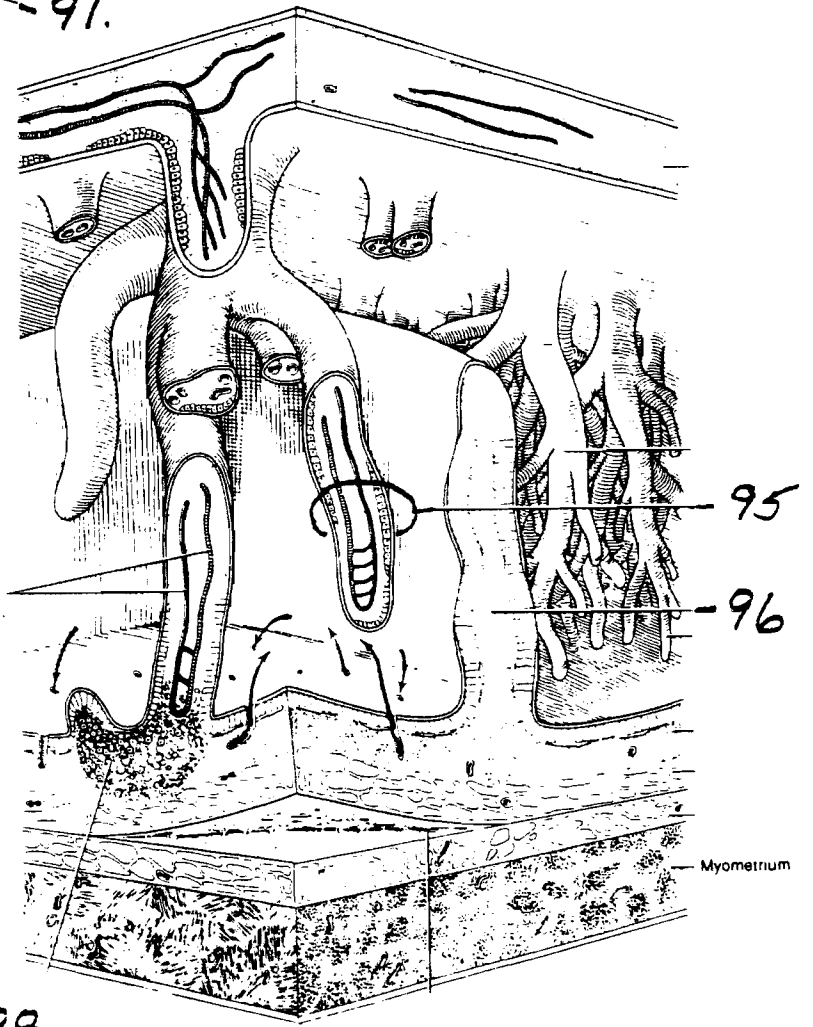
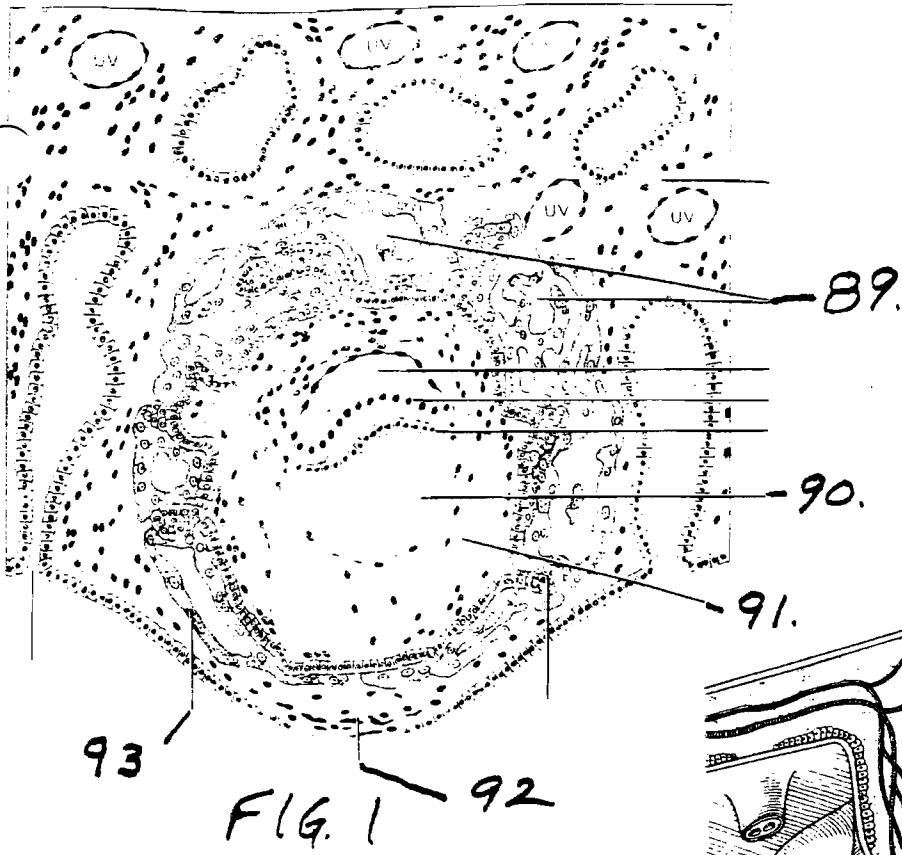
- A. One function of the basal lamina of an epithelium is to hold the epithelial sheet onto the underlying connective tissue. T
- B. The lamina densa is rich in fibronectin and laminin which are necessary for diapedesis to occur. T
- C. Basement membranes surround all the cells of the body. F
- D. A and B are correct.
- E. A, B, and C are correct.

32. Select the **INCORRECT** statement(s).

- A. White fat is used for support around the kidney and eyeball. T
- B. Lipoprotein lipase is the enzyme found in endothelial cells which breaks down triglycerides into fatty acids and glycerol. T
- C. Brown fat is usually not present in the adult human. T
- D. There is a high concentration of oxytalan fibers in the lamina densa of the white adipocytes.
- E. Norepinephrine released by sympathetic neurons stimulates the break down and release of fat from the white adipocytes. T

33. Select the correct statement(s).

- A. A reticular fiber is composed of bundles of type I collagen fibrils surrounded by a sugar coat. F
- B. Mucoid connective tissue contains large numbers of reticulocytes.
- C. Bone marrow contain reticular fibers.
- D. A and B are correct.
- E. A, B, and C are correct.



100

34. Select the INCORRECT statement(s).

- A. Elastic fibers have the microfibrillar component and the elastin component. T
- B. Integrin is a transmembrane protein necessary for the cell to adhere to the underlying connective tissue matrix. T
- ☒ C. The most common extracellular fiber of dense regular connective tissue is collagen type I and II. T
- D. Elastic fibers have the unique amino acid of desmosine and isodesmosine. T
- E. The components of elastic fibers are secreted by the fibroblasts (-cytes) of the elastic tissue. T

35. Select the INCORRECT statement(s).

- ☒ A. Macrophages are transported around the body in the blood vascular system as monocytes. T
- B. Mesenchymal cells are multipotential cells that may differentiate into muscle cells, cartilage or bone cells. T
- C. The plasma cell is normally only found in the intercellular connective tissue space. T
- ☒ D. A pericyte is a unipotential cell associated with capillaries. T
- E. One form of phagocytosis by macrophages requires the presence of opsonin on the cell surface. T

TRUE OR FALSE: A = TRUE; B = FALSE

- A36. A If too much of the substances in the granules of mast cells is secreted due to exposure to an antigen, then a hypersensitive person can go into anaphylactic shock.
- A37. B In scurvy, the lack of vitamin C prevents the bonding between the topocollagen ^{+procollagen} molecules to prevent the formation of the collagen fiber.
- A38. A One form of Ehlers-Danlos syndrome (type VII) is caused by the inability to cleave off the extra segment on the procollagen molecule as it leaves the cell.
- A39. A Edema can be caused by the blockage of lymph nodes by parasites.
- A40. A Lymph fluid is formed by collecting the excess fluid from the extracellular matrix.
- A41. A In scurvy, the little spots of bleeding (petechiae) in the skin of the lower extremities is due to the hydrostatic pressure breaking the weakened small blood vessels.
- B42. B Approximately 70% of the hydroxyapatite crystals in bone are laid down during the secondary phase which lasts several months.

SINGLE BEST ANSWER:

43. Select the correct statement.

- A. ☒ Hyaline cartilage always grows slowly when compared to bone tissue. *F*
- B. ☒ The extracellular matrix of hyaline cartilage contains abundant type III collagen fibers. *F*
- 7 E* ☒ C. ☒ Chondroblasts are capable of secreting tropoelastin. *B*
- D. ☒ An isogenous group (cell nest) in hyaline cartilage is representative of appositional growth. *F*
- E. The perichondrium contains the same amount of chondroitin-6-(4-) sulfate as the hyaline cartilage matrix. *Functional*

44. Select the **INCORRECT** statement.

- A. ☒ Hyaline cartilage is avascular. *T*
- B* ☒ B. ☒ There are no glycoproteins present in hyaline cartilage matrix. *F*
- C. ☒ Cartilage can act as shock absorbers because of the high amount and structure of the proteoglycan aggregates. *T*
- D. ☒ The smooth sliding ability of a synovial joint (knee) is partially due to the presence of numerous proteoglycan aggregates in the extracellular matrix. *T*
- E. ☒ The presence of the water loosely bound to the large proteoglycan molecules allow the nutrients to diffuse through the ground substance.

45. Select the correct statement(s).

- A. ☒ The intervertebral disc consists of elastic cartilage. *F*
- B. When damaged, articular cartilage quickly heals itself by filling in the gap with new hyaline cartilage derived from the cartilage cells surrounding the gap. *F*
- C* ☒ C. ☒ The principal extracellular fiber of fibrocartilage is the type I collagen fiber. *+*
- D. Articular cartilage receives most of its nutrients from the blood vessels running through the perichondrium. *F*
- E. All of the above are correct.

MATCHING:

You may use an answer once, more than once, or not at all. One answer per question.

Match the type of joint (A - E) to the best specific example of that type of joint.

- A. Cartilagenous joint
- B. Synarthrosis — IMM.
- C. Diarthrodial joint — Tot. mov.
- D. Fibrous
- E. Amphiarthrodial joint — part. mov.

- C 46. ___ Knee joint ~~B~~ C
- A 47. ___ Epiphyseal plate A
- B 48. ___ Suture line in skull D
- C A (49) ___ Type of joint affected by osteoarthritis C
- D 50. ___ Intervertebral disc E

Match the proper term (A - E) with the most appropriate description.

- A. Osteoblast
- B. Interstitial lamella
- C. Outer circumferential lamella
- D. Osteoclast
- E. Osteon

- 51. C Formed by periosteum during bone modeling. C
- A 52. D Regulates osteocytic osteolysis A & D
- 53. B Remnant found or left in compact bone after internal remodeling. B
- 54. E Principal structural and functional unit of mature compact bone. E

SELECT THE SINGLE BEST ANSWER:

64. Select the cell that is derived from the monocyte.

- ☒ A. Osteoclast
- ☐ B. Osteoid
- ☐ C. Orthochromatophilic erythroblast
- ☐ D. Myoblast
- ☐ E. Plasma cell

65. Which statement is correct? In sickle cell anemia...

- ☐ A. ~~X~~ red blood cells stay flat because they have too little hemoglobin.
- ☐ B. ~~X~~ patients have anemia because not enough cells are made.
- ☒ C. red blood cells are fragile because hemoglobin aggregates around spectrin.
- ☐ D. ~~X~~ anemia is not a feature of this disease.
- ☐ E. ~~X~~ red blood cells can get through small caliber vessels without any difficulty.

66. Which of the following statements about hematocrit is correct:

- ☒ A. ~~X~~ It is determined by centrifuging the blood to separate the plasma from the serum.
- ☐ B. ~~X~~ It becomes decreased with acute infection.
- ☐ C. ~~X~~ It is defined as the percent volume of white blood cells per unit volume of blood.
- ☒ D. It will decrease with hemorrhage.
- ☐ E. ~~X~~ It will decrease with increased altitude.

67. Which statement best defines a "shift to the left"?

- ☐ A. This occurs when there are too many red cells in the spleen.
- ☐ B. This occurs when the number of red blood cells increases in the blood.
- ☐ C. This occurs when the number of mature basophils increases in the blood.
- ☒ D. This occurs when the number of circulating band cells increases.
- ☐ E. This occurs when basophils differentiate into mast cells.

68. Select the correct statement about antigen-presenting cells.

- A. They serve to focus the attention of neutrophils on cell surfaces.
- B. They take in antigen by exocytosis and couple it to HLA I for presentation to T cells.
- C. ✗ They kill cytotoxic lymphocytes but do not require specific antigens.
- D. ✗ They bind to the surfaces of mast cells.
- ☒ E. They take in antigen by endocytosis and couple it to MHC II and put the complex back at the cell surface for presentation to lymphocytes.

69. Which statement is NOT correct regarding the thymus?

- A. Hassall's corpuscles are composed of clusters of degenerated epithelial-reticular cells.
- B. The blood-thymus barrier is first created when a sheath of epithelial-reticular cells forms around capillaries in the thymic cortex.
- C. The 3 major cells types present in the thymus are epithelial-reticular cells, lymphocytes and macrophages.
- D. Thymic capillaries enter the cortex from the medulla.
- ☒ E. The thymus of a 6 year old human is a major site of production of T lymphocytes.

Differ/Mature

70. The characteristic cytoplasmic staining of the basophilic erythroblast is due to:

- A. abundant microtubules in the cytoplasm.
- B. abundant hemoglobin in the cytoplasm.
- ☒ C. abundant mitochondria in the cytoplasm.
- D. abundant ribosomes in the cytoplasm.
- ☒ E. abundant DNA in the cytoplasm.

71. Lymph travels through a lymph node via which pathway?

- A. Cortical sinus to medullary sinus to trabecular sinus to efferent lymph vessel.
- ☒ B. Subcapsular sinus to cortical sinus to trabecular sinus to medullary sinus to efferent lymphatic vessel.
- C. Subcortical sinus to trabecular sinus to paracortical sinus to medullary sinus to efferent lymphatic vessel.
- D. Trabecular sinus to subcortical sinus to paracortical sinus to medullary sinus to efferent lymphatic sinus.

72. Which statement is **INCORRECT** regarding blood?

- A. ☒ All cellular components of blood have a limited life span, are produced throughout life and all are generated from a common progenitor cell.
- B. ☒ Commitment to a particular line of differentiated cells is followed by a series of cell divisions that amplify cells of a given specialized type.
- C. ☒ The components of the blood are red blood cells, white blood cells, megakaryocytes and plasma proteins.
- D. ☒ Main functions of the blood include oxygen transport, transport of hormones, nutrient and waste transport, and transport of antibodies.
- E. ☒ The pluripotent stem cell is capable of self renewal, has resting and proliferative stages, and can not be identified by it's morphology.

73. Which is **NOT** a component in the bone marrow?

- A. ☒ Reticular cells
- B. ☐ Macrophages
- C. ☒ Hematopoietic cords
- D. ☐ Megakaryocytes
- E. ☒ Osteomicros

74. Where is erythropoietin produced?

- A. ☐ Lungs
- B. ☐ Pancreas
- C. ☐ Spleen
- D. ☒ Kidneys
- E. ☒ Bone marrow

What do megakaryocytes give rise to?

- A. ☐ Microkaryocytes
- B. ☒ Platelets
- C. ☐ Reticulocytes
- D. ☐ Microsomes
- E. ☐ Hassall's corpuscles

76. Five types of white blood cells are divided into two main groups, name one.

- A. Leukocytes
- ☒ B. Granulocytes
- C. Lymphocytes
- D. Monocytes
- E. Null cells

77. What one word best characterizes the immune response?

- ☒ A. Specific
- B. Random
- C. Uncontrolled
- D. Undirected
- E. Unresponsive

MATCHING: An answer may be used once, more than once, or not at all. One answer per question.

Match the cell (A - E) with the most appropriate location.

- A. Antigen presenting cell
- B. Activated B cells
- C. Splenic macrophages
- D. Plasma cells

78. B Cells in the center of a lymphoid nodule or follicle.

79. A Follicular dendritic cells

80. B Cells commonly found in medullary cords.

81. C Splenic cords next to sinusoid.

Match the process (A - E) with the most appropriate description or location.

- A. Endochondral ossification
- B. Primary ossification center
- C. Appositional growth
- D. Intramembranous ossification
- ~~E. Interstitial growth~~

55. E Zone of proliferation E
- * 56. A Primary spongiosa B
57. D Laying down bone matrix on small bone islands in the flat bones of the skull. D
58. B Center of diaphysis in long bone. B A

TRUE OR FALSE: A = TRUE; B = FALSE

- * 59. A The cement line is where bone tissue is first laid down in a forming osteon.
- A 60. A The osteoclast uses carbonic anhydrase to lower the extracellular pH which dissolves the hydroxyapatite crystals in the region of the ruffled border. A
- A 61. A Matrix vesicles containing alkaline phosphatase can initiate mineralization in both cartilage and bone matrix.
- A 62. A The lump surrounding the healing fracture of a bone is due to the formation of the external callus.
- B 63. B If your blood Ca^{++} concentration is too low, ^{PTH} calcitonin will be released and cause the osteoclasts to increase their activity.

TRUE OR FALSE: A = TRUE; B = FALSE

- B 82. Opsonization is the method by which T-lymphocytes digest foreign particles. *E*
- A 83. Epithelial nurse cells function in acquiring self tolerance. *L*
- B A 84. In the spleen, lymph fluid moves from the periarterial lymphatic sheath to the red pulp. *E*
- A 85. Perforins are secreted by cytotoxic T cells and are responsible for making holes in target cell membranes and cell killing. *B*
- A 86. M cells transfer antigens from the lumen to the Peyer's patch. *A*
- E* 87. The primary role of the spleen is to filter and remove old or damaged red blood cells and platelets and provide a primary immune response to lymph borne antigens.

SELECT THE SINGLE BEST ANSWER:

- GC* 88. A non-striated, voluntary muscle is: *None*
- A. Skeletal muscle.
 - B. Cardiac muscle.
 - C. Smooth muscle.
 - D* D. None of the above.
89. Which protein is **NOT** involved in the structure of the thin filaments of skeletal muscle?
- A. Actin
 - B. Troponin
 - C. Tropomyosin
 - D. α -Actinin
 - E* E. Myosin

90. Which of the following is a structural feature unique to cardiac muscle?
- A. A bands
 - B. I bands
 - C. Transverse tubules
 - ☒ D. Diad structure of the sarcoplasmic reticulum
 - E. Abundant mitochondria
91. Which of the following is a structural component of the cardiac intercalated disk?
- ☒ A. α -Actinin
 - ☒ B. Zonula adherens
 - C. Zonula occludens
 - ☒ D. Desmosomes
 - ☒ E. Gap junctions
92. Reticular fibers are important components in the force transduction network of:
- ☒ A. Smooth muscle.
 - B. Cardiac muscle.
 - C. Skeletal muscle.
 - D. All of the above.
 - E. None of the above.
93. Which of the following is NOT true of the choroid plexus in the cerebral ventricles?
- A. ✓ It is covered by a simple cuboidal epithelium.
 - B. ✓ It is composed of loose connective tissue.
 - C. ✓ It is responsible for the production of cerebrospinal fluid from fenestrated capillaries.
 - D. ✓ It is located in the ventricular cavities.
 - ☒ E. It comprises and is an integral portion of the blood/brain barrier.
94. Which of the following is NOT true of myelin?
- A. ✓ It is produced by Schwann cells.
 - B. ✓ It serves as an electrical insulator for axons.
 - C. ✓ It is produced by oligodendrocytes.
 - ☒ D. It can replace neurons following neuronal damage.
 - E. ✓ It functions to accelerate nerve conduction velocity.

ACA E

99. Which of the following is true about an asymmetrical synapse?

- A. They are found only in the peripheral nervous system.
- B. Most commonly the presynaptic density is thicker than the postsynaptic density.
- C. They usually contain flat, clear synaptic vesicles.
- ☒ D. They are generally considered excitatory synapses.
- E. They are only found at axo-axonic synapses.

100. Which of the following is NOT true of dendrites?

- A. ☒ Dendritic processes generally taper with distance from the cell body and successive branching.
- ☒ B. ☒ They are the primary signal ^{conducting} portion of the neuron.
- ☒ C. ☒ They can often show pedunculated membrane specialization called spines.
- D. They have a microtubule-dependant transport mechanism similar to axons.
- E. ☒ They have numerous cytoplasmic filaments which provided rigidity.

Id #:
Name: ELDER, KEVIN E

Class: MICROANATOMY
Time:

Course #: MICRO956

				A
				AB D
Test Key: DEACBCDDBA	DADBABBABB	AABBBABBA	DDCCDABAAA	ABCBCCBDCE
Items 1-50: 1234567890	1234567890	1234567890	1234567890	1234567890
Student's Answers: ***E**A***	*****	B*****	A***AA*A***	***E*****A*

				A
				B
				D
Test Key: CABEEADBAA	AABACDDE D	BCEDBBABAD	CBABAABDED	EAEDABEBDB
Items 51-100: 1234567890	1234567890	1234567890	1234567890	1234567890
Student's Answers: *D***C**B*	***** E	*AAE*****B	***A**A***	*****E*****